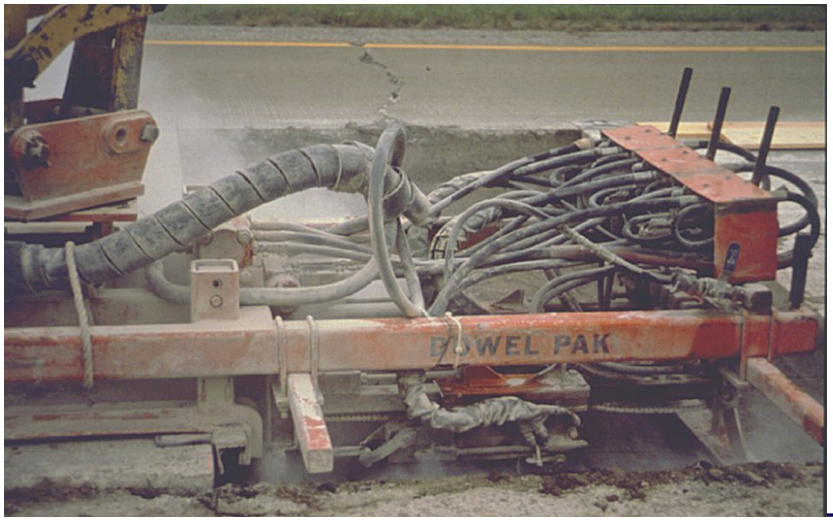
CHAPTER 6 PAVEMENT JOINT PREPARATION



Gang drill for dowel bar installation

All existing pavement joints that border the slab replacement area must be prepared immediately prior to placement of the fresh concrete. This preparation consists of placement of dowel bars, tie bars, and expansion materials.

DOWEL BAR INSTALLATION

For most repairs of jointed pavements, doweled transverse joints are essential for load transfer. The recommended number of dowel bars and bar spacing are discussed on page 17 under *Load Transfer Design*. All dowels must be placed parallel to the longitudinal joints.

Caltrans typically recommends the following dowel diameters:

- 38-mm diameter dowel bars provide effective load transfer for slab replacement in highway pavements
- For pavements less than 180 mm thick, dowel bars are not recommended

Dowel bars should be placed at two locations within each slab replacement boundary: at the transverse interface between the new and old PCC pavement (transverse contact joints) and at the sawcut joints within the new slabs (transverse weakened plane joints), aligned with the longitudinal edge of the slab.

TRANSVERSE CONTACT JOINTS

Automatic dowel drilling equipment produces straight, consistent holes faster than single, hand-held drills. Modern dowel drilling equipment is mounted on a boom or on a frame with wheels that are maneuverable on a job site. If proper slab removal dimensions are selected, adequate space will allow for automatic dowel drilling equipment operation. To improve consistency, single, frame-mounted, or hand-held drills should not be used.

Either standard pneumatic or hydraulic percussion drills are acceptable for drilling dowel holes. Both drill a typical dowel hole in about 30 seconds. Avoid electric-pneumatic rotary drills where speed and production are essential, because they take three to four times longer to drill each hole.

TRANSVERSE CONTACT JOINTS

Contact joint with dowels and expansion caps

Note: End caps are not needed if a portland cement mix is used, which shrinks

Weakened plane joint with dowels (without expansion caps)

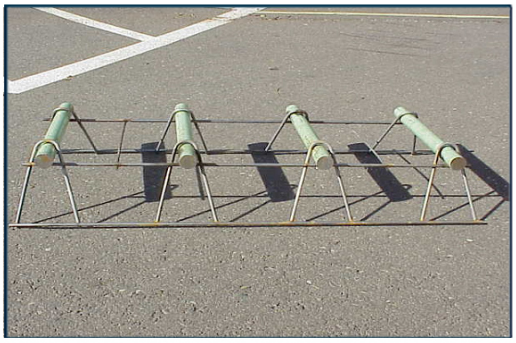
After drilling, clean out the dowel holes by inserting an air nozzle into the hole to force out all dust and debris. Dust and dirt prevent the epoxy or non-shrink grout from bonding to the concrete around the perimeter of the hole. Oil also prevents good bonding. Therefore, always check the air for oil and moisture contamination from the compressor by blowing some air into a piece of dry cloth.

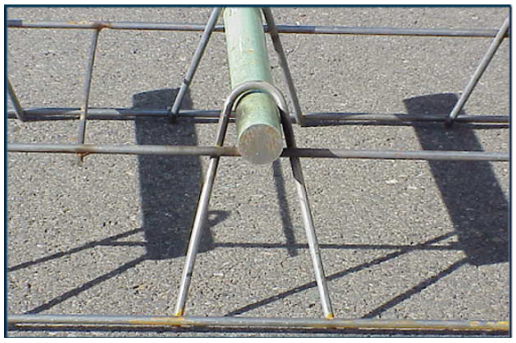
Caps must be placed on one end of each transverse contact joint dowel, if a non-shrink cement mix will be used. A good rule of thumb is that all cements that are not portland cement may be considered non-shrink. Dowels that are drilled and bonded with epoxy do not need caps on the side placed in the drilled hole.

Place the anchoring material using a long nozzle that feeds the material to the back of the hole. This ensures that the anchoring material will flow forward along the entire dowel embedment length during insertion and decreases the likelihood of leaving voids between the dowel and the concrete. Prefabricated epoxy cartridges are available that supply enough material for one or two holes, but a faster and less expensive system for large projects is to use a pressurized injection system from bulk epoxy containers.

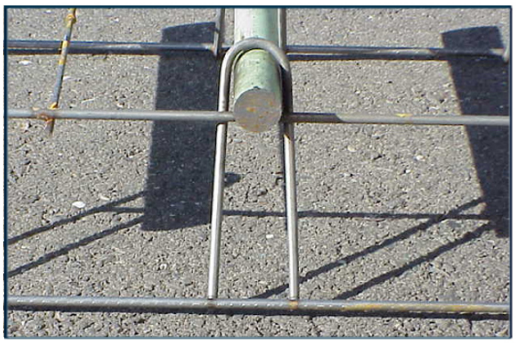
As dowel bars are placed, they should be rotated gently to coat the dowel with epoxy and provide uniform bonding.

TRANSVERSE WEAKENED PLANE JOINTS





A-Type dowel bar basket



U-Type dowel bar basket

J-Type dowel bar basket (not allowed)

TRANSVERSE WEAKENED PLANE JOINTS

Dowels should be placed at all weakened joints within a slab repair using type A or U baskets. Type J baskets do not meet the Caltrans specifications and are not allowed.

See page 19 for guidelines on transverse joint orientation.

Each basket must be anchored securely with approved concrete fasteners (for a 3.65-m-wide slab) that are evenly spaced at 0.3 m to hold all dowels firmly at the specified depth and alignment. Once the baskets are anchored, cut the manufacturer's tie wires.

Expansion caps are not needed for weakened plane dowel basket assemblies because dowel bars are greased and cured RSC shrinks away from the saw cut.

TRANSVERSE WEAKENED PLANE JOINT (CONTINUED)

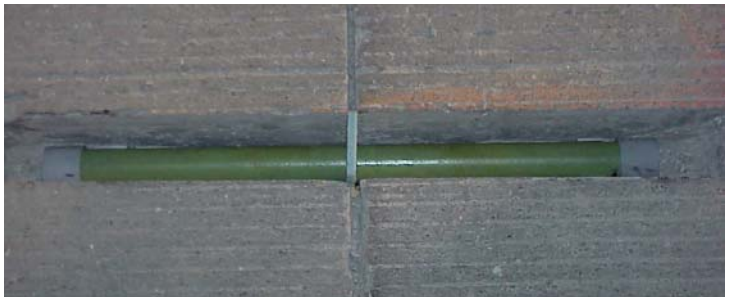
Cut tie wires

Once the dowels are placed, and prior to concrete placement, watch for any signs of misalignment during the concrete placement. Misalignment of the dowels will lead to increased stresses within the new concrete pavement and result in premature cracking and failure of the repaired pavement section.

Where the existing transverse weakened plane joint spacing in an adjacent lane exceeds 4.6 m, an additional transverse weakened plane joint must be constructed midway between the existing joints (see p. 19 for illustration).

TIE BAR INSTALLATION

Caltrans currently uses tie bars on all longitudinal joints on new construction. Tie bars are placed perpendicular to the longitudinal contact joint at a pavement depth (D) equal to D/2. Tie bars between existing slabs and "newly placed" concrete should only be placed if the existing pavement has tie bars. Tie bars help mainly to keep lanes from separating. See the table on page 21 for guidelines on when to use tie bars on slab replacements.



Retrofit dowel bar on PCC surface

Retrofit dowel bars placed in PCC pavement slots

DOWEL BAR RETROFIT

For contact joints, dowel bar retrofit may be used if dowels were not installed during the slab repair. Drilling, cleaning, and epoxying the dowel bars into the existing concrete may require more time than is allowed on the construction site. Therefore, retrofit dowel bars may be selected due to a narrow construction window. Dowel bar retrofit should be installed according to Caltrans' standard specifications and plans. Dowel bar retrofits may be installed after the slab replacement has been opened to traffic, during one of the following construction shifts.

Expansion material

PAVEMENT JOINTS

After installation of all required dowel bars and immediately prior to concrete placement, the transverse and longitudinal pavement joints must be prepared properly.

TRANSVERSE CONTACT JOINTS

A 6-mm-thick, commercial-quality polyethylene flexible foam expansion material must be placed securely across each transverse contact joint. This material must extend along the slab face, with the top of the expansion material flush with the top of the pavement. In addition, the expansion material must be cut to fit with holes for drill-and-bond dowels.

The expansion material should be secured to the face of the existing pavement joint, and concrete should not be allowed to get between the expansion material and existing rigid pavement. If fresh concrete does get between the expansion material and the existing pavement, spalling will likely occur in the near future.

LONGITUDINAL CONTACT JOINTS

Expansion materials are not required along the longitudinal contact joint for isolated pavement slab repairs of only one slab, unless the joints of adjacent slabs do not match. Expansion materials may also be used along longitudinal contact joints if the adjacent pavement slabs are scheduled for replacement. Use of the expansion materials prevents bonding at the longitudinal joint and will reduce slab removal and replacement times.

If expansion material is used along the longitudinal joints, it must be placed securely across the entire length of the joint and extend along the height of the slab, with the top of the expansion material flush with the top of pavement joint.